

**SPS-6 Construction Report
US Highway 12 Westbound
Approximately 15 Miles East of Aberdeen, South Dakota
Test Sections 460601 - 460608**

**Federal Highway Administration
Long Term Pavement Performance
North Central Region**

Report Prepared By:

Ronald R. Urbach, CET
Benjamin J. Worel, PE
Braun Intertec Corporation
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, MN 55439-0108

Project DBNX-92-700
June 28, 1996

BRAUNSM
INTERTEC

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6875 Washington Avenue South
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612-941-5600 Fax: 942-4844

*Engineers and Scientists Serving
the Built and Natural Environments®*

June 28, 1996

Mr. Richard Ingberg
Regional Engineer
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, MN 55439-0108

Dear Mr. Ingberg:

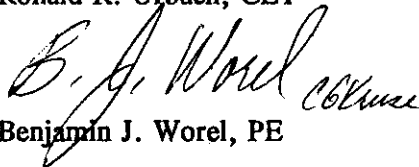
Enclosed is the construction report for the SPS-6 South Dakota project.

If you have any questions about this report please call either Ronald Urbach at (612) 942-3055 or Benjamin Worel at (612) 942-3057.

Sincerely,



Ronald R. Urbach, CET



Benjamin J. Worel, PE

Attachment: Report

c: Mr. Monte Symons, FHWA
Mr. John Miller, PCS/Law
Mr. Cameron Kruse, Braun Intertec

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1.0 Introduction

The SPS-6 is a study of the rehabilitation of jointed Portland Cement Concrete (PCC) pavement. It is a study of various PCC concrete restoration techniques in combination with variations in asphalt overlay thicknesses from 4 and 8 inches

1.1 Experimental Cell

This project is located in the dry-freeze environmental region. The subgrade soil is too soft for fine-grained. The agency classified the pavement as being in fair condition. The reason for rehabilitation is combination of D-Cracking, fording, pumping, and joint failure.

1.2 Summary of Supplemental Testing Sections

The agency has included three supplemental test sections in this project.

- Installation of reinforcing 4-inch grade, with joint overlay
- Crack, break, and seat with reinforcing 4-inch grade, with joint overlay
- Crack, break, and seat with 6-inch overlay

1.3 Project Location

This SPS project is located on westbound US Highway 12. It is approximately 15 miles east of Aberdeen, South Dakota, on the west side of the small town of Groton, South Dakota. The project starts at approximately milepost 307.17 and ends at approximately milepost 308.52.

1.4 Type of Roadway

The existing pavement is an 8-inch thick jointed plain concrete. There are approximately 4 inches of cement treated aggregated base over the clay subgrade. The joint spaces are random distances of 16 feet, 17 feet, 21 feet, and 20 feet. And joints are placed as skew.

The concrete pavement was originally placed in 1973. There are two lanes of traffic in each direction.

The reason for the rehabilitation was that the pavement was experiencing D-crack, fording, pumping, and joint (load-transfer) failures.

1.5 Traffic Characteristics

Annual average daily traffic (two directions)	7,480
Percent heavy trucks and combinations (of AADT)	10.4 percent
Count Year of AADT Estimates	1990
18-kip ESAL rate in proposed study lane (ESALs/year)	200,000
Estimated total 18-kip ESAL applications in study lane	2,500,000

The test sections are located so as to have only local crossroads and crossovers within the project. The crossroads are travel roads that have only a limited amount of traffic and should not affect the traffic counts on the project.

1.6 Known Deviations From Guidelines

There are few minor deviations for this project and they are summarized in the project deviation report formats in Attachment D of this construction report

1.7 Geometry

The roadway is relatively straight with very little grade change. When the roadway was constructed in 1972-73, there were approximately 2 to 3 feet of fill clay soil placed to proposed grade.

1.8 Underground Structures Within Test Sections

The test sections were located as to not have any underground structures within the test sections. Because of the relatively flat area, crossover core rise was very limited in this area.

1.9 Installation of Weather Station

There was no weather station required for SPS-6 project.

1.10 Installation of the WIM

The WIM is located on the west end of the project. For uniform support for the existing concrete pavement was removed and new concrete was placed foundation for the weigh-in-motion. The weigh-in-motion was placed from project stationing 426+40 to 425+80. The WIM system is using the bending-plate technology. It is manufactured by

International Road Dynamics Cooperated
702 43rd Street East
Saskatoon, Saskatchewan
Canada, S7K-3T9

The contact person is Mr. Rod Klashinsky, at (306) 934-6777.

The weigh-in-motion was not installed by representatives of International Road Dynamics. They were assisted by local contractors for some of the work.

1.11 Schedule for Opening to Traffic

The patching of the existing PCC was started in April, 1992. The rehabilitation was completed and opened to traffic in September, 1992.

During the rehabilitation of the PCC permanent lane closures for a single lane of traffic were placed during the rehabilitation of the PCC. During the overlay processes temporary lane closures were placed on alternative sides of the roadway.

1.12 General Problems

There were no major weather or equipment related delays

1.13 Resident Engineer Information

The coordination of this project was handled through the South Dakota Department of Transportation, Material and Research Office, is located in Pierre, South Dakota

Mr David Huft	(605) 773-3292	South Dakota Department of Transportation
Mr Blare Lunde	(605) 773-5961	700 Braodway Avenue East
Mr Cannons Marks	(605) 773-3370	Pierre, South Dakota 57501-2586
Fax Number	(605) 773-3921	

The day-to-day project management was handled through the Aberdeen, South Dakota Area Office

The people involved are from this office were

Mr Eugene Mattern, Area Engineer	(605) 622-2244
Mr Gary De Jong	(605) 662-7898
Mr Havey Michlitch	(605) 662-7898

South Dakota Department of Transportation
West Highway 12
P O Box 1767
Aberdeen, South Dakota 57402-1167

Mr Michlitch was the field engineer and was responsible for obtaining and completing construction data forms

1.14 Materials Sampling and Testing

The pre-construction material sampling and testing was completed on April 7 and April 8, 1992
This was done under contract with the agency and Braun Intertec Engineering

Mr Mark Flynn
Braun Intertec Engineering
6800 South County Road 18
Minneapolis, MN 55439-0108

Phone	(612) 941-5600
Fax	(612) 941-4151

The sampling during construction and the post construction sampling was coordinated by Mr Havey Michlitch. The sampling, testing and coring was performed by agency personnel and agency equipment.

Representatives from the LTPP North Central Office include

Dr Eugene Skok
Mr Benjamin Worel
Mr Robert Van Sambeek
Mr Ronald Urbach

SHRP Regional Engineer

Mr Richard Ingberg
6875 Washington Avenue South
P O Box 39108
Minneapolis, MN 55439-0108
Phone (800)-344-7477
Fax (612) 942-3059

1.15 Contractor Information

The general contractor for the project was

Border States Paving
P O Box 3162
Fargo, North Dakota 58102

The subcontractor to Border States Paving was The Concrete Doctor, which performed the PCC concrete under-sealing.

The Highway Services performed the repair of the PCC pavement.

1.16 Summary of Key Construction Equipment

PCC Patching

Diamond Blade Pavement Saw
Tractor Backhoe
Jack Hammer

Asphalt Batch Plant

Boeing Dryer Drum

Asphalt Pavement Placement

Barber Greene Model BG260 Paver
Caterpillar Model WE851B Pick Up Machine

Barber Greene Model SB140
Single Steel Drum Vibratory Roller
Double-drum Steel Vibratory Roller

Crack/Break and Seat
Guillotine Drop Hammer
35 Tone Seating Roller
Sweeper

Subdrainage Retrofit
Trenching Machine
Tractor Backhoe
Small Vibrating Compactor

Crack Sealing
Diamond Blade Pavement Saw
Air Compressor with Sand-Blasting Equipment
Crafco Hot Pour Joint Seal Equipment

Surface Grinding
36-inch Wide Surface Grinder

2.0 Project Details

Attachment A is a copy of the map for the state of South Dakota, which indicates all GPS and SPS projects

Attachment B is a copy of the site location map from the project specifications

Attachment C is a copy of the tests section location map, which indicates the test section with the 6 digit LTPP number. This map also is a reference to the project stationing, type of equipment, type of restoration that was performed, and asphalt overlay thicknesses

Attachment D is a copy of the LTPP SPS deviation report

Attachment E is a copy of the pre construction material sampling and testing plan. This work was performed under contract with the agency by Braun Intertec Engineering

Attachment F is a copy of the post construction sampling and testing plan. This work was done by agency personnel, using agency equipments

Attachment G is a table indicating the type of work that was performed on each of the test sections. This summary includes both the eight core experiment test sections and three supplemental test sections

2.1 Summary of the Procedures

PCC Patching

A chaindrag was used to determine the areas where patching was required. A diamond-blade pavement saw was used to cut off the perimeter of the areas to be patched. A jack hammer was then used to break up the material to be removed, a tractor backhoe removed the material. After the areas were prepared for patching, concrete ready mix from Aberdeen Ready Mix was used to do the patching.

Crack/Break and Seat

A Guillotine style drop hammer was used to crack the pavement. After the pavement was cracked, the 35-ton seating roller was used to seat the pavement. After the seating roller was done, a power sweeper was used to remove any concrete chips were left on the pavement.

Subdrainage Retrofit

A trenching machine was used to prepare the area along the edge of the pavement for the installation of the drain tile. A small vibrating compactor was used to compact the backfill as it was placed. A small tractor backhoe was used to excavate for the edge drains outlays.

Surface Grinding

A 36-inch wide surface grinder was used to grind the PCC pavement. This was done in the areas where asphalt concrete overlays were not placed. The surface grinding was done to remove the fording of joints.

Asphalt Paving

An asphalt patching plan Boeing dryer drum plant was used to make the asphalt concrete pavement. A Barber Greene Model BG260 paver and a Barber Greene Model SB140 paver were used to place the asphalt concrete pavement. The asphalt concrete mix was brought to the project with belay dump type trucks. A Caterpillar model WE851B pick up machine was used to pick up the asphalt concrete from the pavement and place it into the paver. By using the pick up machine this eliminated the paver stopping and starting for each load of mix. By eliminating frequent start/stops, a better riding surface should result. A single-drum steel vibratory roller and a double-drum steel vibratory roller were used to compact the asphalt concrete pavement.

Crack Sealing

A diamond-blade pavement saw was used to prepare the crack for sealing and to prepare the reservoir. After this was done, an air compressor with sand blasting equipment was used to clean the edge of joint. After the joints were sand blasted, compressed air was used to clean out the joint. A Crafcro hot pour joint seal equipment was used to place the hot joint sealing.

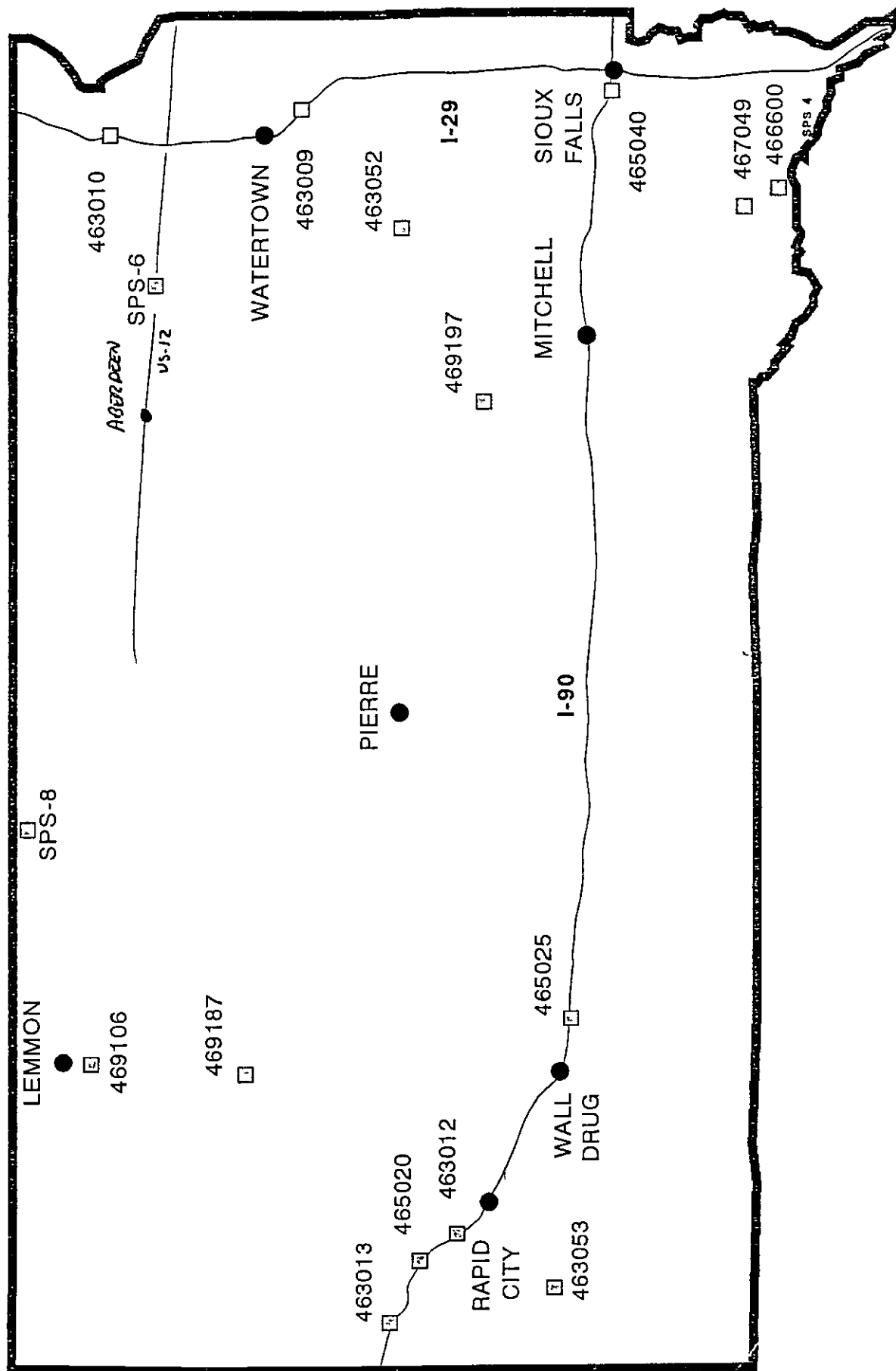
After the concrete patching was performed, temporary traffic control was used to place the asphalt concrete overlay

Traffic was placed on the project in October, 1992

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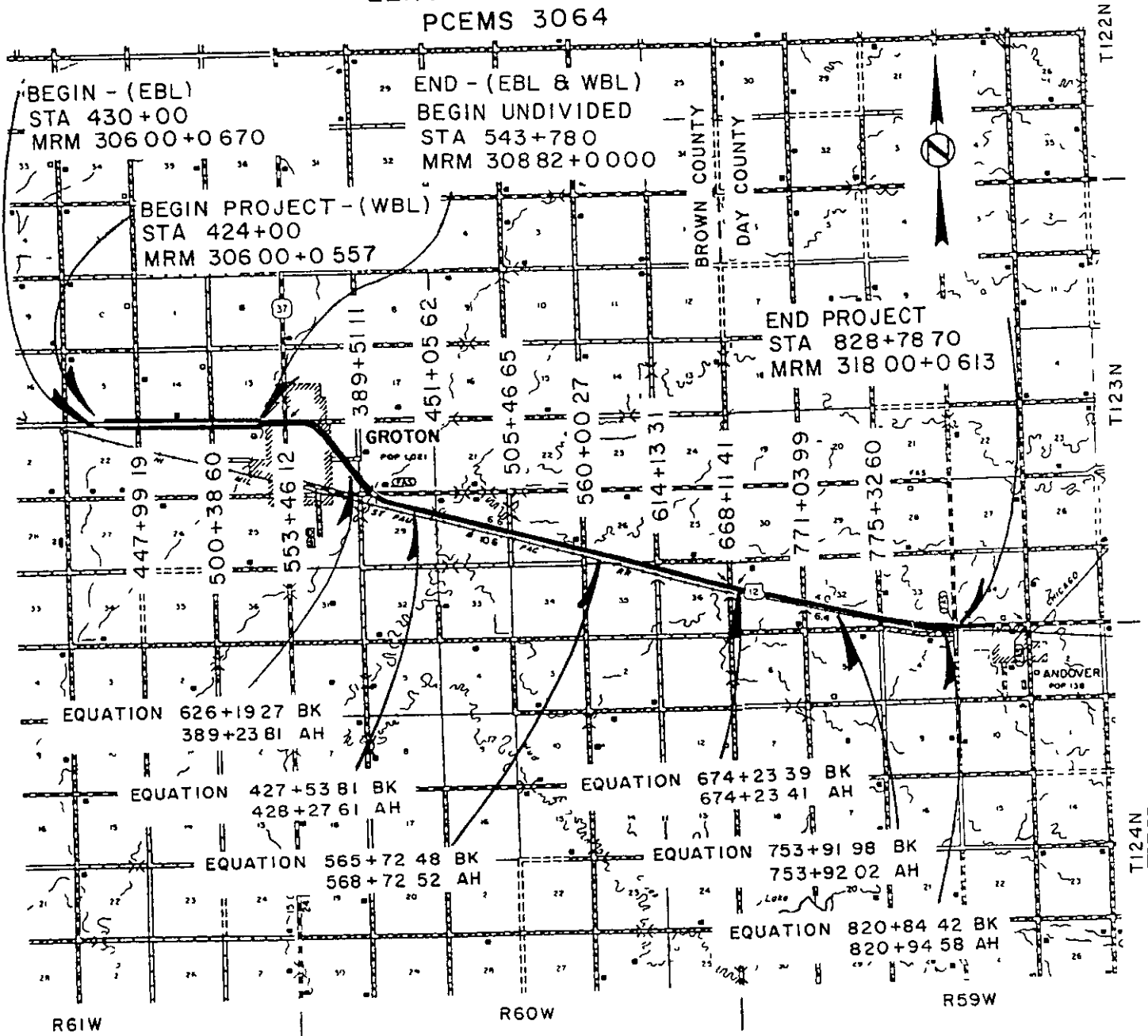
Attachment A
Project Location Site Map

LTPP TEST SITE LOCATIONS SOUTH DAKOTA GENERAL PAVEMENT STUDIES



Attachment B
Project Location Map

FO012(61)306
 BROWN & DAY COUNTIES
 PCC PAVEMENT CRACKING & SEATING
 ASPHALT CONCRETE RESURFACING
 AND FLATTENING SLOPES ON APPROACHES
 LENGTH .12 023 MILES
 PCEMS 3064



Attachment C
Test Section Layout

WIM

STA 425+80 - 426+40

460601
ROUTINE MAINTENANCE
430+10 - 435+10
NO OVERLAY

460602
MINIMUM RESTORATION
437+00 - 447+00
NO OVERLAY

460605
MAXIMUM RESTORATION (CPR)
451+00 - 461+00
NO OVERLAY

460604
MINIMUM RESTORATION
468+09 - 473+09
SAW & SEAL JOINTS IN AC
4" OVERLAY

460603
MINIMUM RESTORATION
479+94 - 484+94
4" OVERLAY

460606
MAXIMUM RESTORATION (CPR)
487+12 - 492+12
4" OVERLAY

460661 (460611)
REINFORCING GRID (STATE EXP)
493+88 - 498+88
4" OVERLAY

460662 (460610)
CRACK, BREAK & SEAT (STATE EXP)
501+08 - 506+08
REINFORCING GRID
4" OVERLAY

460607
CRACK, BREAK & SEAT
508+11 - 513+11
4" OVERLAY

460660 (460608 - 460609)
CRACK, BREAK & SEAT (STATE EXP)
514+94 - 519+94
6" OVERLAY

460608 (460609)
CRACK, BREAK & SEAT
522+05 - 527+05
8" OVERLAY



SOUTH DAKOTA
SPS 6
US-12 WESTBOUND
WEST OF GROTON

MARCH 1, 1995
STA 501+22 = MP 308
S:\LTPP\SHOP\SPS6_SD.CH3

NOTE:

Sections were changed 6/16/93 memo to:

460609 - 460608
460608 - 460650

Sections were changed 2/11/94 to:

460610 - 460662
460611 - 460661

State normal practice is the same as
section 460607 (no 460659 needed)

Attachment D
LTPP SPS Project Deviation Report

LTPP SPS Project Deviation Report
Data Collection and
Materials Sampling and Testing Deviations

State Code			<u>4</u>	<u>6</u>
Project Code	<u>0</u>	<u>6</u>	<u>0</u>	<u>0</u>

☒ Comments Pertain to All Test Sections on Project

☐ Comments Pertain Only to Section(s) (Specify) _____

Date Collection & Material Sampling and Testing Deviation Comments

Rod and level elevation measurements were not performed to evaluate overlay thickness

Some agency laboratory testing was performed using non LTPP protocols

Some inventory data missing, lack of records at agency

LTPP SPS Project Deviation Report
Site Location Guidelines Deviations

State Code
Project Code 0 6 4 6
 0 0

☒ Comments Pertain to All Test Sections on Project

☒ Comments Pertain Only to Section(s) (Specify) _____

Site Location Guideline Deviation Comments

None

LTPP SPS Project Deviation Report
Construction Guidelines Deviations

State Code			<u>4</u>	<u>6</u>
Project Code	<u>0</u>	<u>6</u>	<u>0</u>	<u>0</u>

☒ Comments Pertain to All Test Sections on Project

☐ Comments Pertain Only to Section(s) (Specify) _____

Construction Guidelines Deviation Comments

Overlay thickness were with in the 25 4 m (1") of design

LTPP SPS Project Deviation Report
Other Deviations

State Code
Project Code

		4	6
0	6	0	0

☒ Comments Pertain to All Test Sections on Project

☒ Comments Pertain Only to Section(s) (Specify) _____

Other Deviation Comments

Some of the test sections had their numbers changed

Attachment E
Pre Construction Sampling and Testing Plan

BRAUNSM
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117 2004
612 776 7522 Fax 776 7201

*Engineers and Scientists Serving
the Built and Natural Environments*

DATE March 23, 1992

MEMO TO Mr Blair Lunde

FROM Ron Urbach *RRU*

RE Pre-Construction Materials Sampling and Testing *PLAN*

*PRE-CON
(COPY)*

As indicated in my memo dated March 17, 1992, pre-construction materials sampling and testing is part of the requirements for the SHRP SPS-6 projects. This project is located on Westbound US Highway 12 near Groten, South Dakota.

Braun Intertec Engineering (the SHRP NC drilling and sampling contractor) estimated the time needed to complete the recommended drilling and sampling to be approximately 1-1/2 days.

Attached is a copy of the sampling plan. This plan was completed using the SHRP Specific Pavement Studies Materials Sampling and Testing Requirements for experiment SPS-6 rehabilitation of jointed Portland Cement concrete pavements.

There are eight test sections and one supplemental state sections.

In place of the test pits three 12" OD cores/soil sampling will be performed with the addition of the state supplemental section.

Coring and/or sampling to be performed:

- 22 - 4" OD cores
- 3 - 6" OD cores with 2 thin-walled tubes or splitspoon samples or combination per hole
- 9 - 12" BA holes will be completed. After coring, bulk sampling will be completed in each of the BA holes.
- 3 - 20' auger probes may be performed. If the DOT can supply soils information the 20' auger probes will not be completed.

The location of the cores may be shifted because of joints or cracks.

We would like you to supply a proposed sampling plan for the during and post-construction sampling and testing.

Please contact me if you require additional information.

cc Gene Skok
Dick Ingberg

Eugene P. Matter^h
Kent Larson

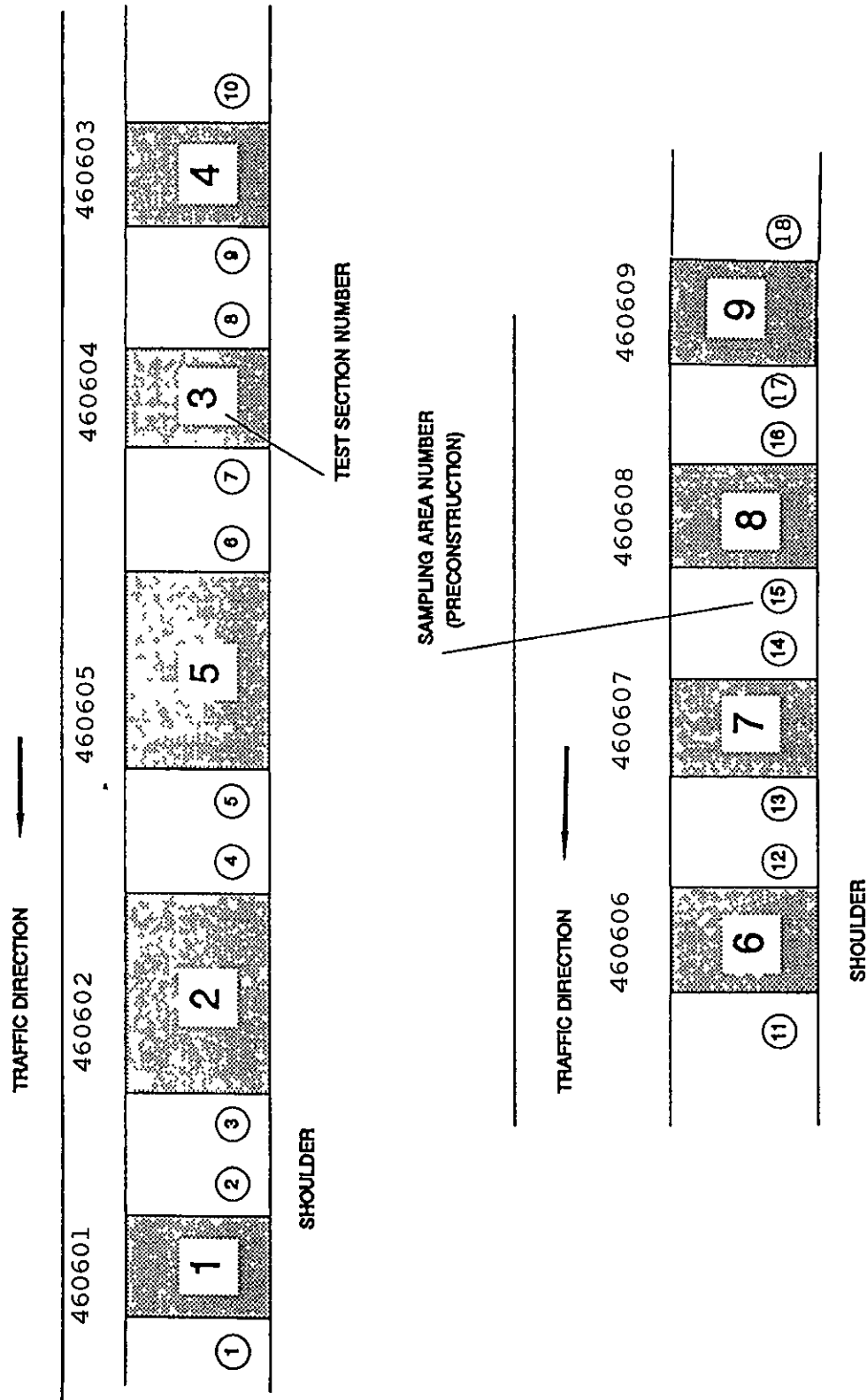


Figure A.1 Example of "Pre-Construction" Sampling Area Plan

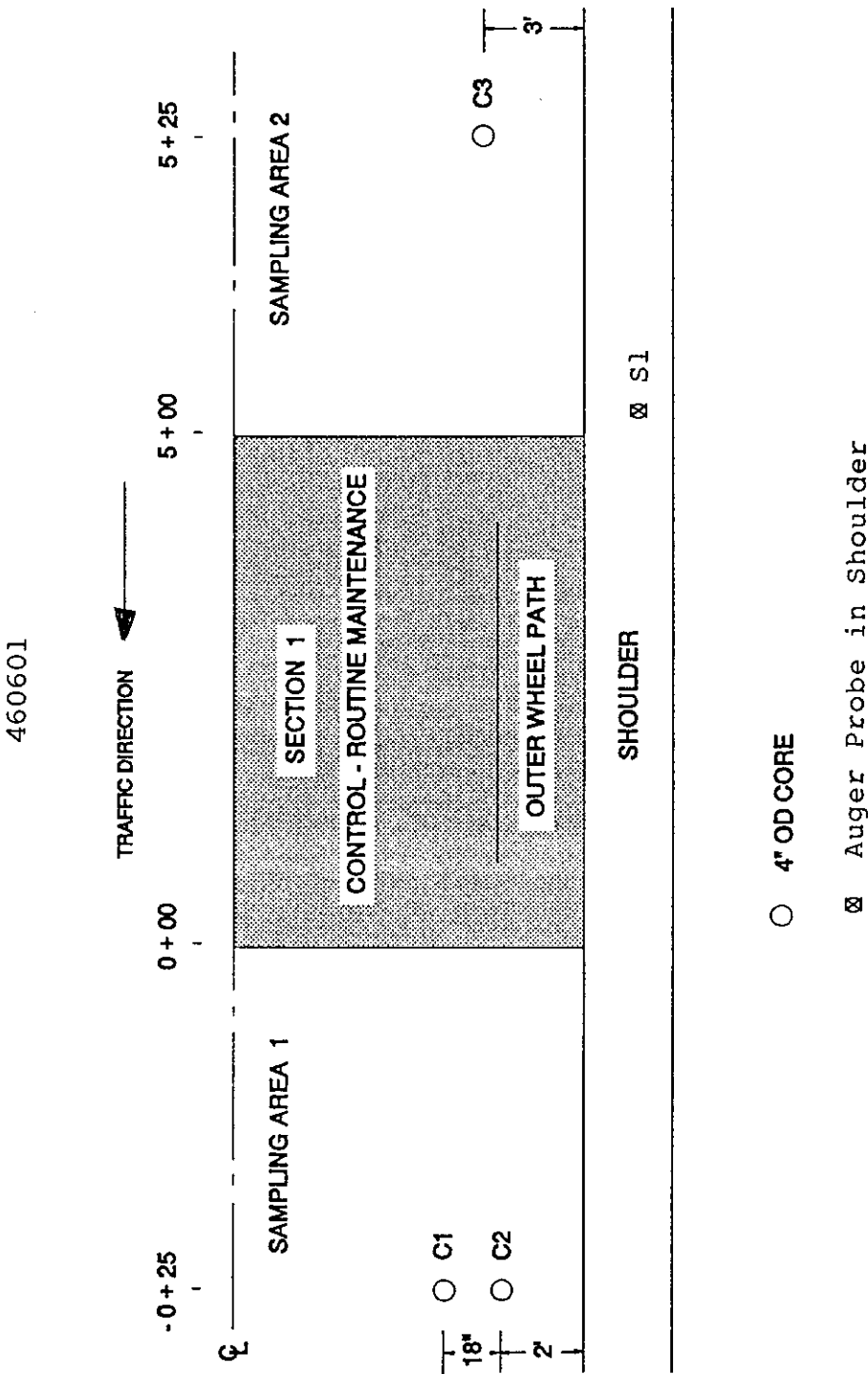


Figure A.2 Example of "Pre-Construction" Sampling Plan for Test Section 1

460602

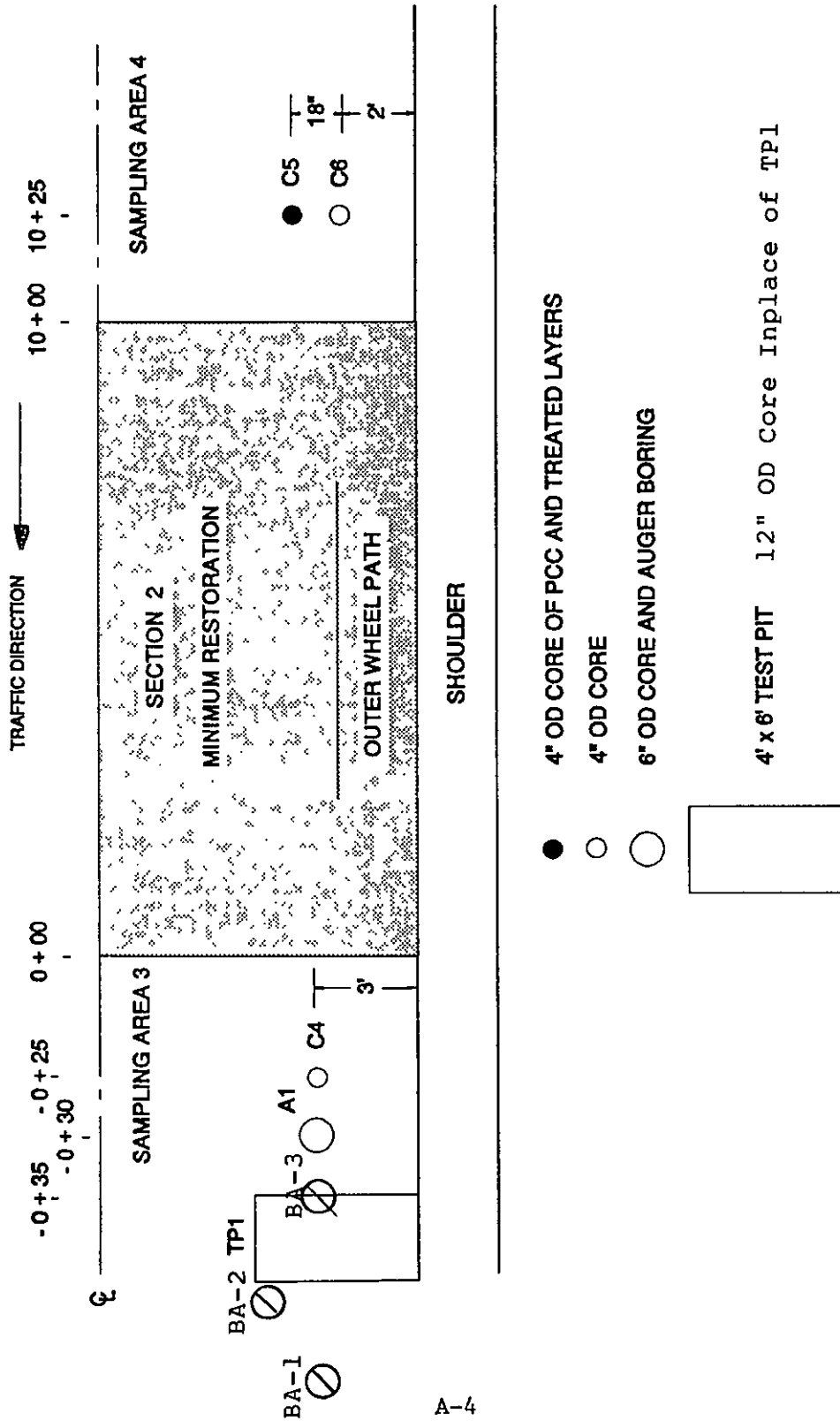


Figure A.3 Example of "Pre-Construction" Sampling Plan for Test Section 2

460605

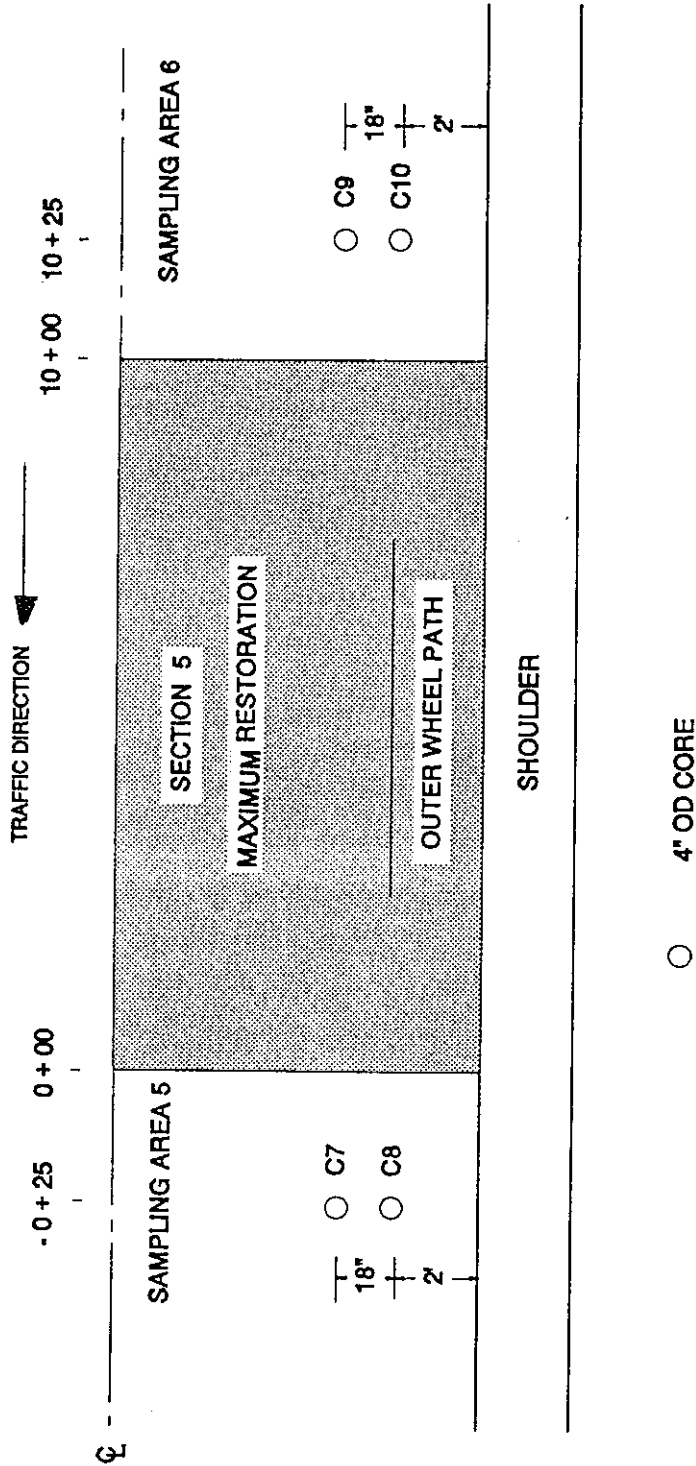


Figure A.4 Example of "Pre-Construction" Sampling Plan for Test Section 5

460604

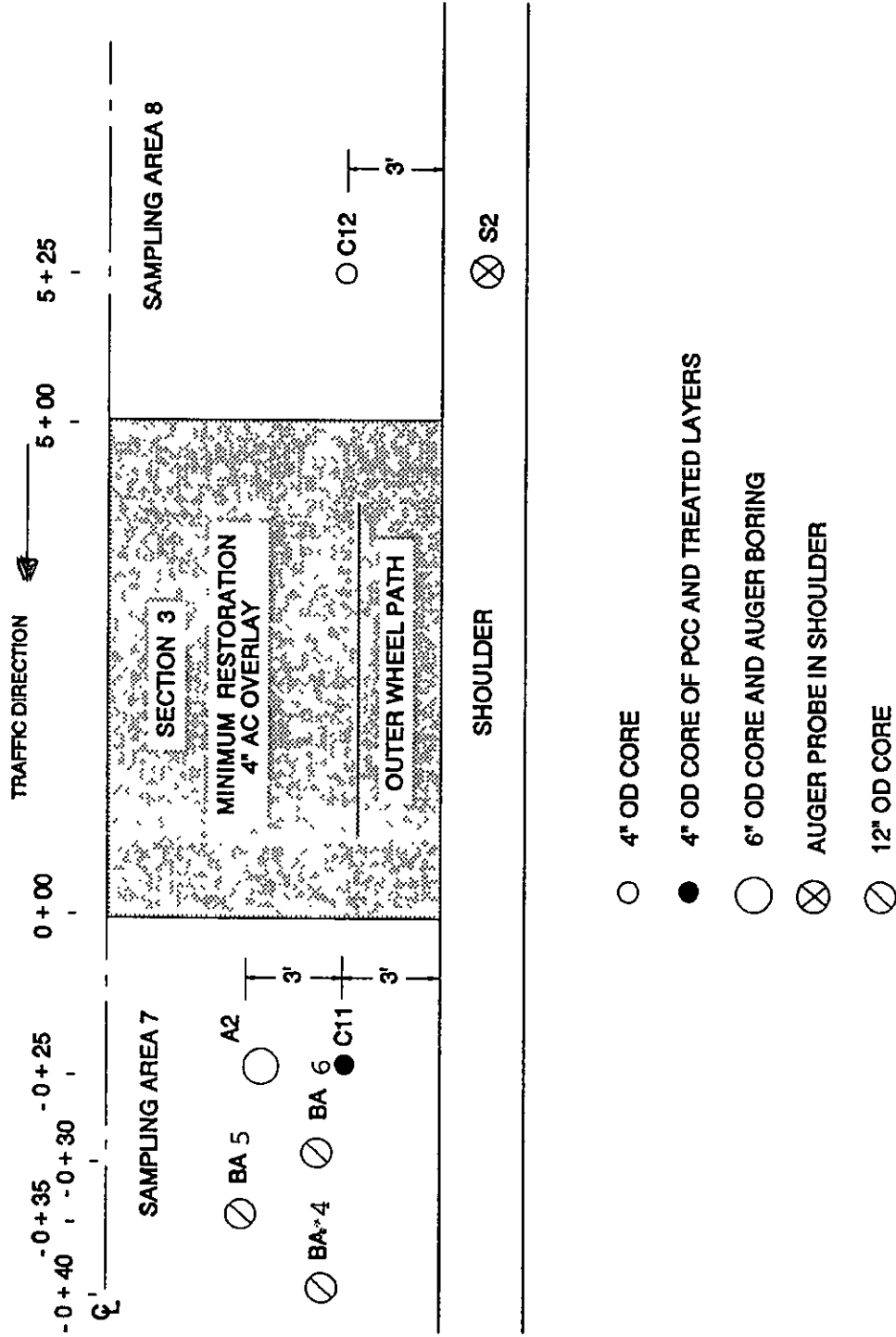


Figure A.5 Example of "Pre-Construction" Sampling Plan for Test Section 3

460603

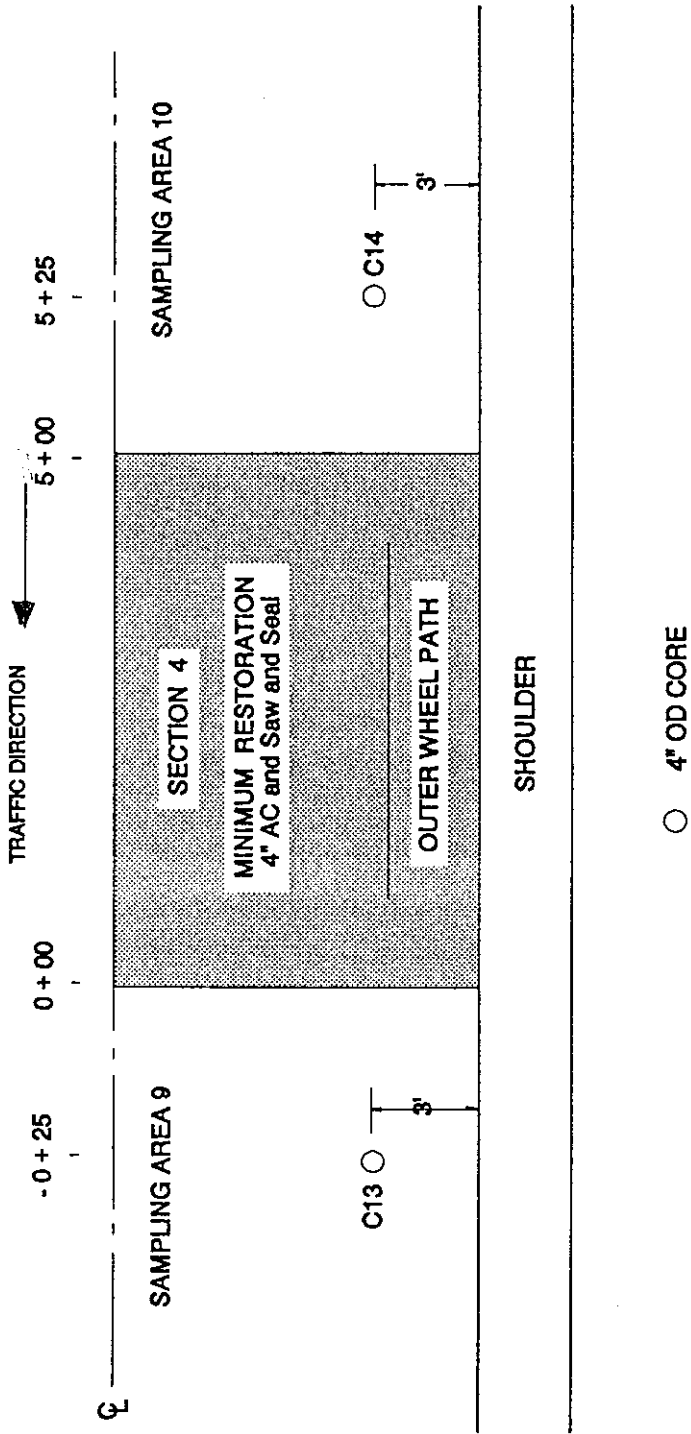
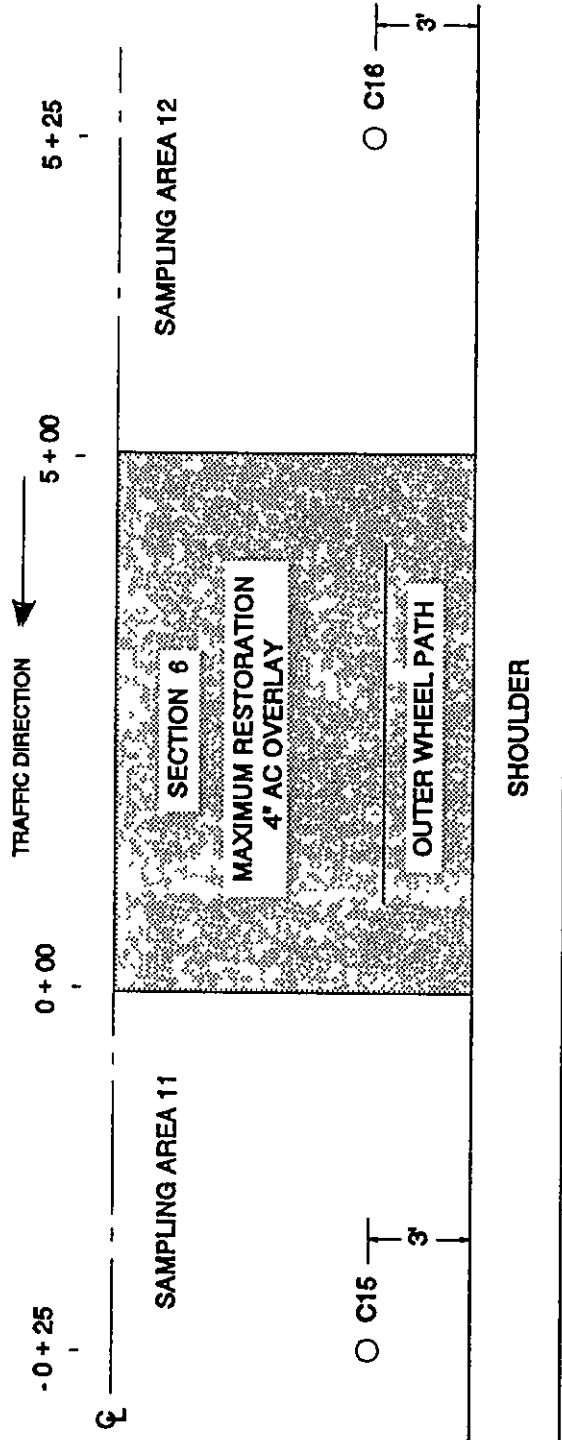


Figure A.6 Example of "Pre-Construction" Sampling Plan for Test Section 4

460606



○ 4" OD CORE

Figure A.7 Example of "Pre-Construction" Sampling Plan for test Section 6

460607

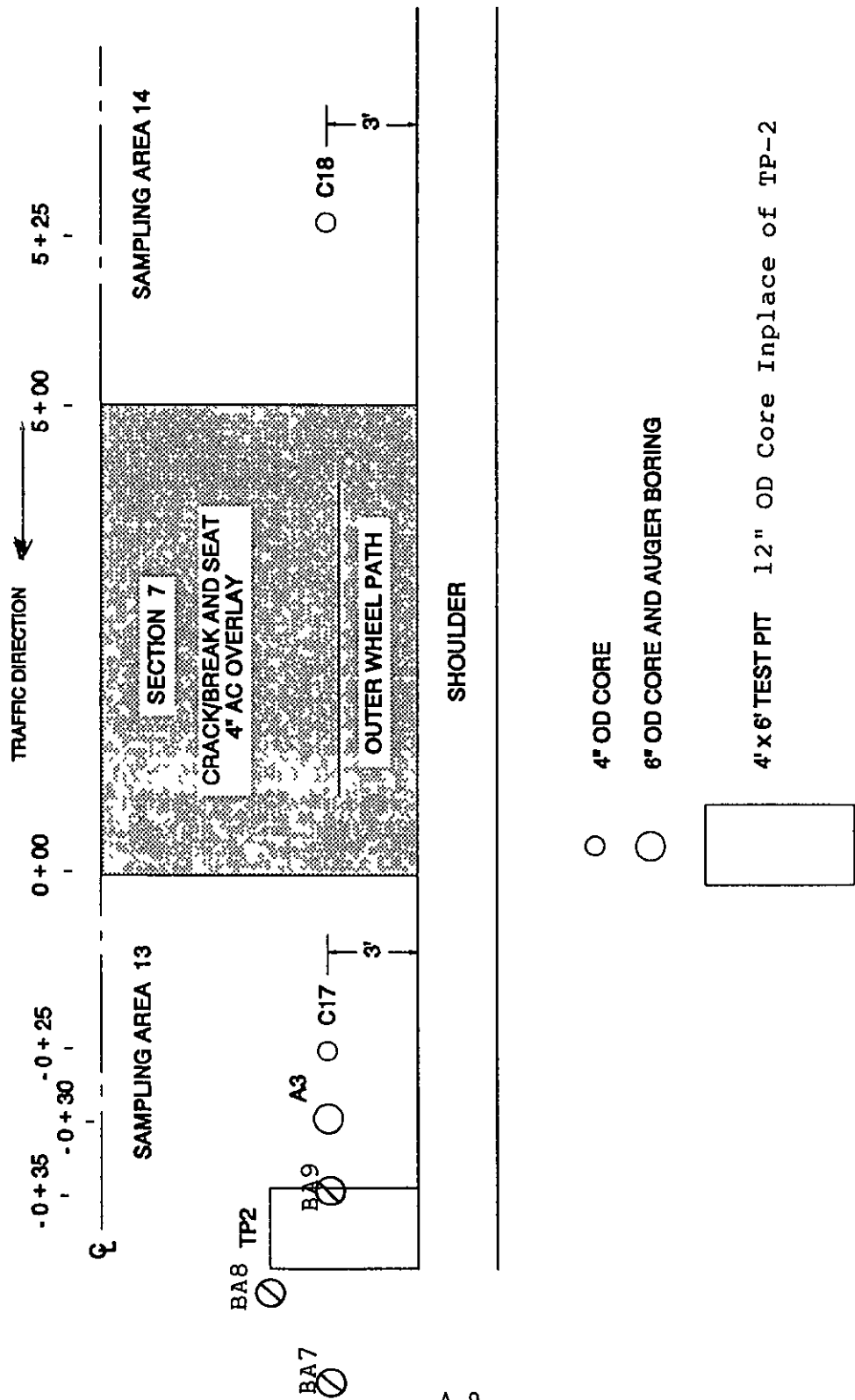
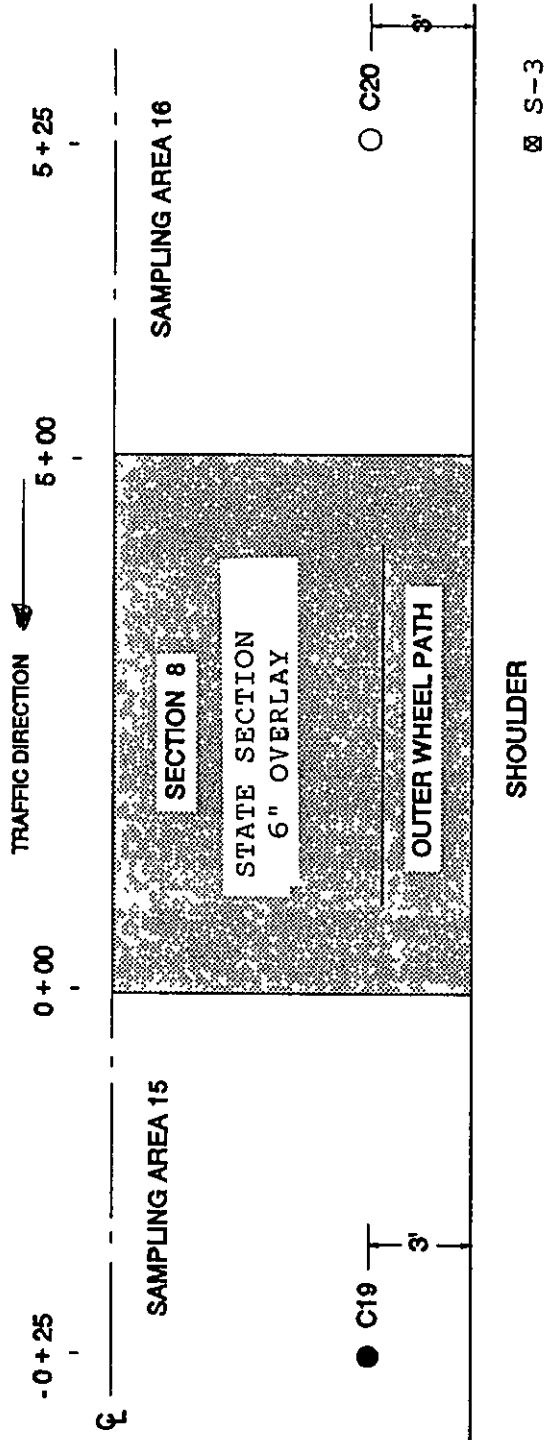


Figure A.8 Example of "Pre-Construction" Sampling Plan for Test Section 7

460608



- 4' OD CORE
- 4' OD CORE OF PCC AND TREATED LAYERS
- ⊗ AUGER PROBE IN SHOULDER

Figure A.9 Example of "Pre-Construction" Sampling Plan for Test Section 8

460609

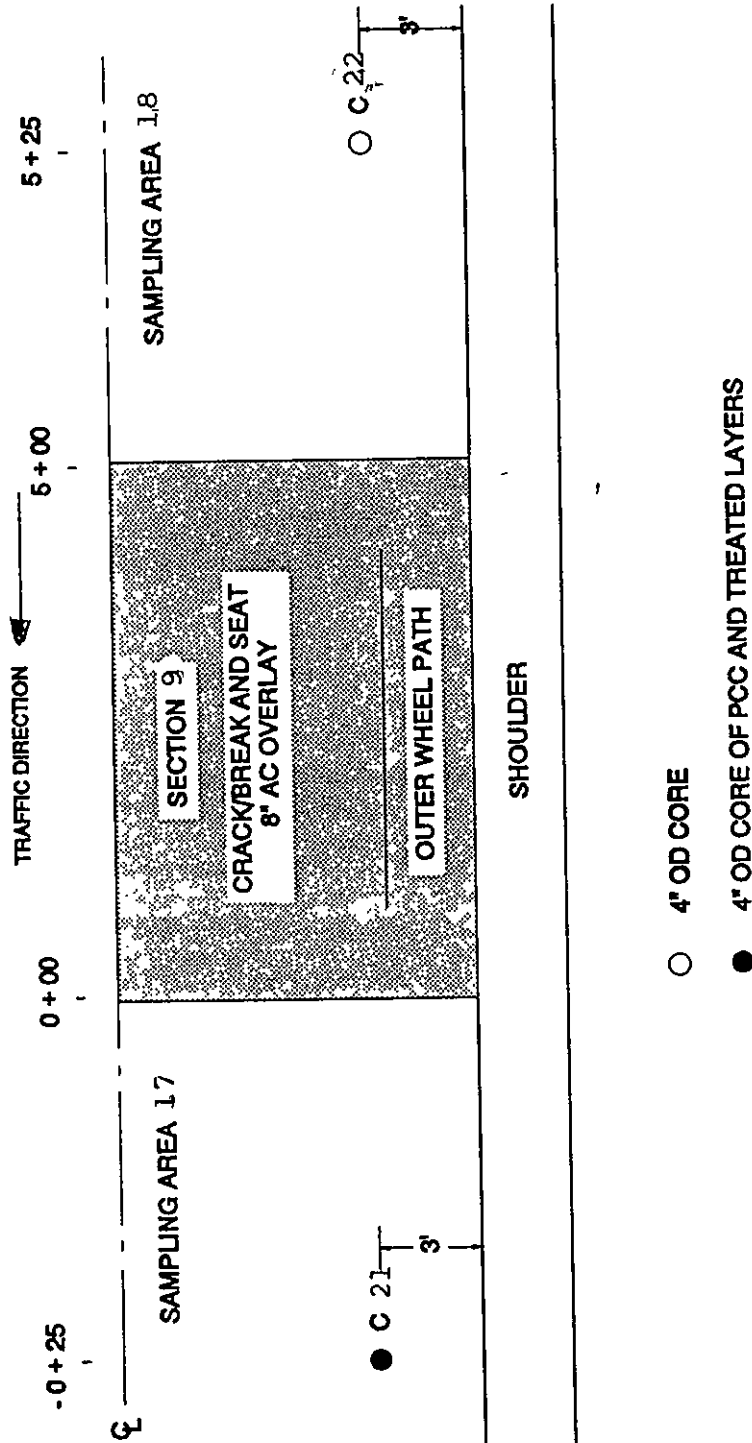


Figure A.9 Example of "Pre-Construction" Sampling Plan for Test Section 9

Attachment F
Post Construction Sampling and Testing Plan



Department of Transportation
Division of Planning

700 E Broadway Avenue
Pierre, South Dakota 57501-2586 605/773-3174
FAX 605/773-3921

ABR. AREA

F.S.
#2
POST CORES

Office of Research

May 26, 1992

Ron Urbach
Braun Intertec Pavement, Inc
1983 Sloan Place
St Paul, Minnesota 55117-2004



Dear Ron,

The South Dakota Department of Transportation will be taking four inch diameter cores after construction as required in Table 4 of the Material Sampling and Testing Requirements for expenment SPS-6 The cores will be taken in the areas listed on the enclosed site layout and sampling location sheets

Testing of the materials will be taken care of by the South Dakota Department of Transportation as specified in the Material Sampling and Testing Requirements

If any additional information is needed please contact me at (605) 773-5961 or Dave Huft at (605) 773-3358

Sincerely,

Blair Lunde

CC Eugene Mattern

UPDATED BJW
12/94

⇒ CORE D&S FORM
(ALL CORES DOCUMENTED)
⇒ TEST RESULT OBTAINED

Shoulder

Direction of Travel



460609	23	24	25	460608	26	27	460607	28	29	460610	30
--------	----	----	----	--------	----	----	--------	----	----	--------	----

Shoulder

SHRP Test Section Number

Shoulder

Direction of Travel



460611	31	32	33	460606	34	35	460603	36	37	460604	38
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Shoulder

Sampling Area Number

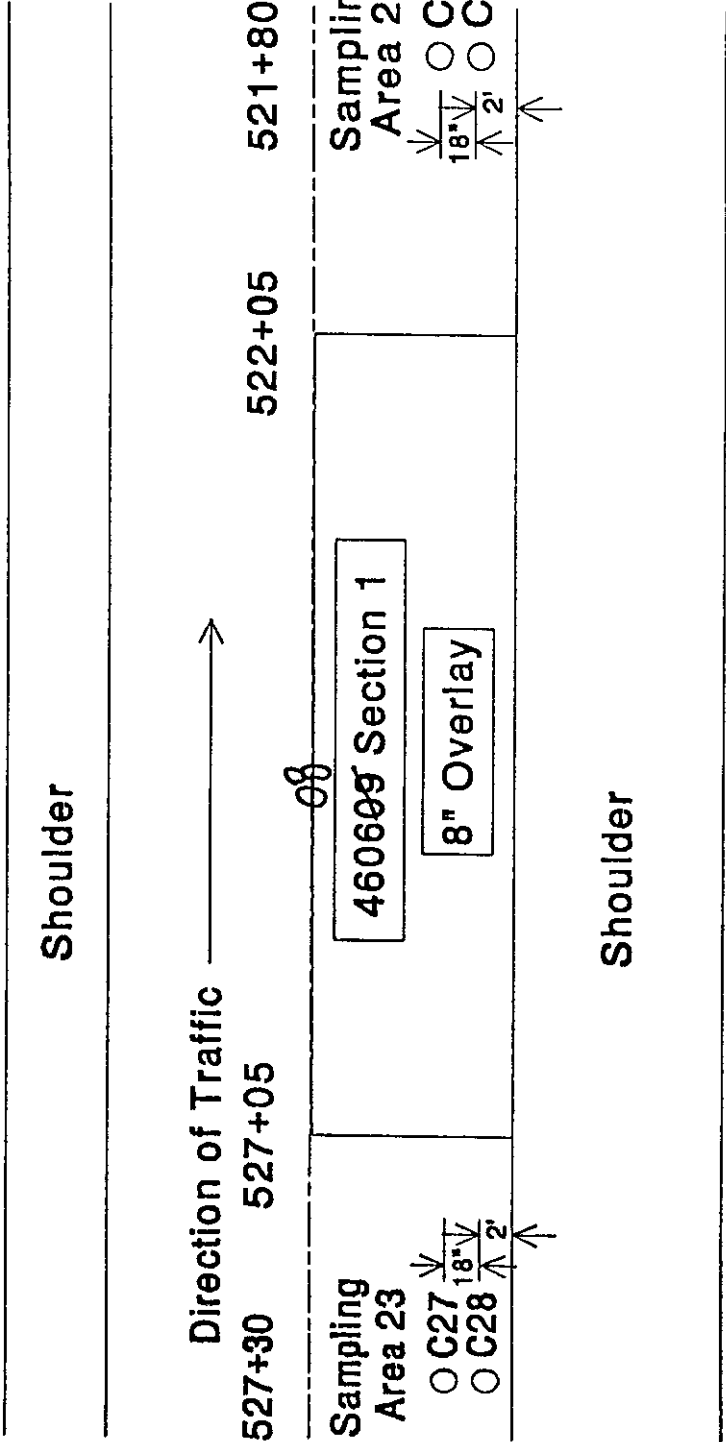
Shoulder

Direction of Travel

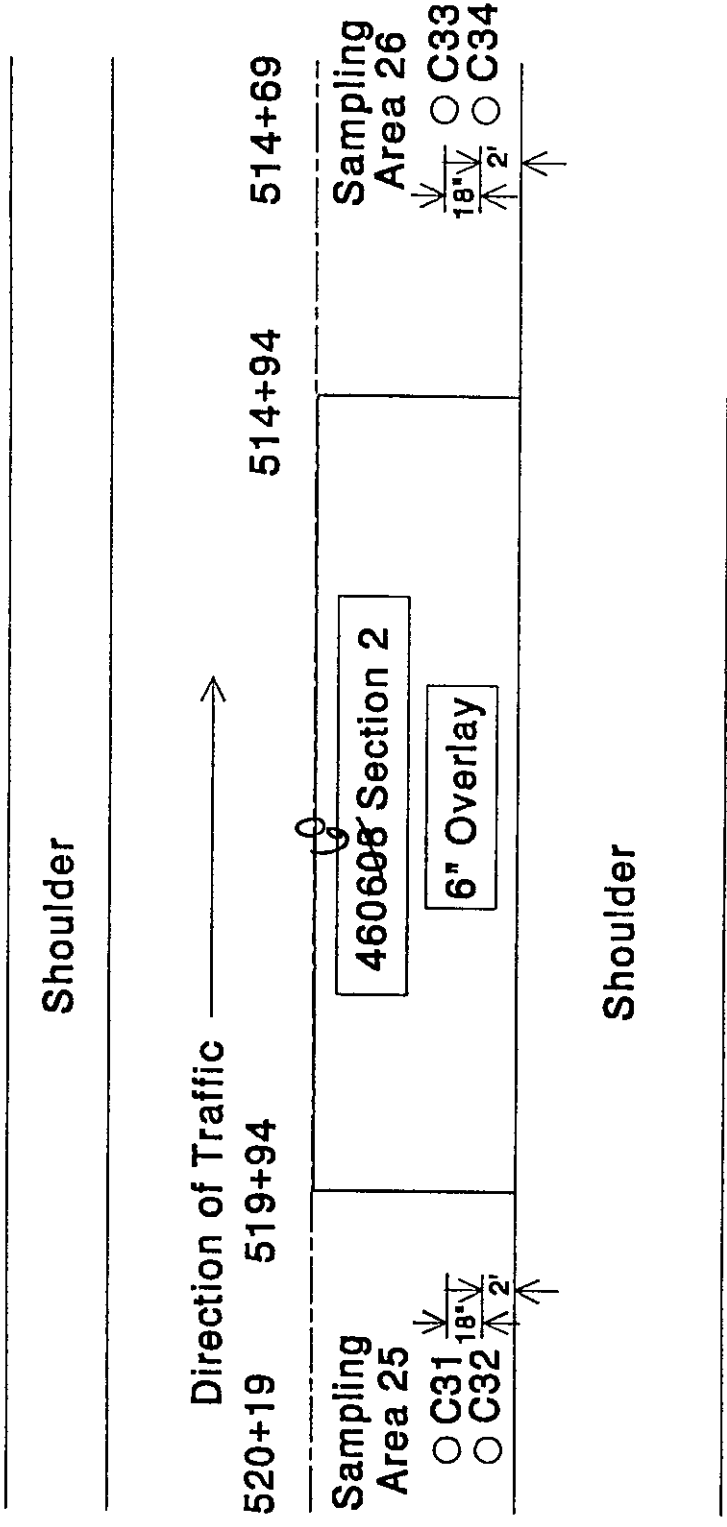


460605				460602			460601				
--------	--	--	--	--------	--	--	--------	--	--	--	--

Shoulder



○ 4" OD Core



○ 4" OD Core

Shoulder

Direction of Traffic →

513+36 513+11

508+11 507+86

Sampling
Area 27

○ C35
○ C36

460607 Section 3

4" Overlay

Sampling
Area 28

○ C37
○ C38

Shoulder

○ 4" OD Core

Shoulder

Direction of Traffic →

506+33 506+08

Sampling
Area 29

○ C39
○ C40

4606' Section 4

4" Overlay

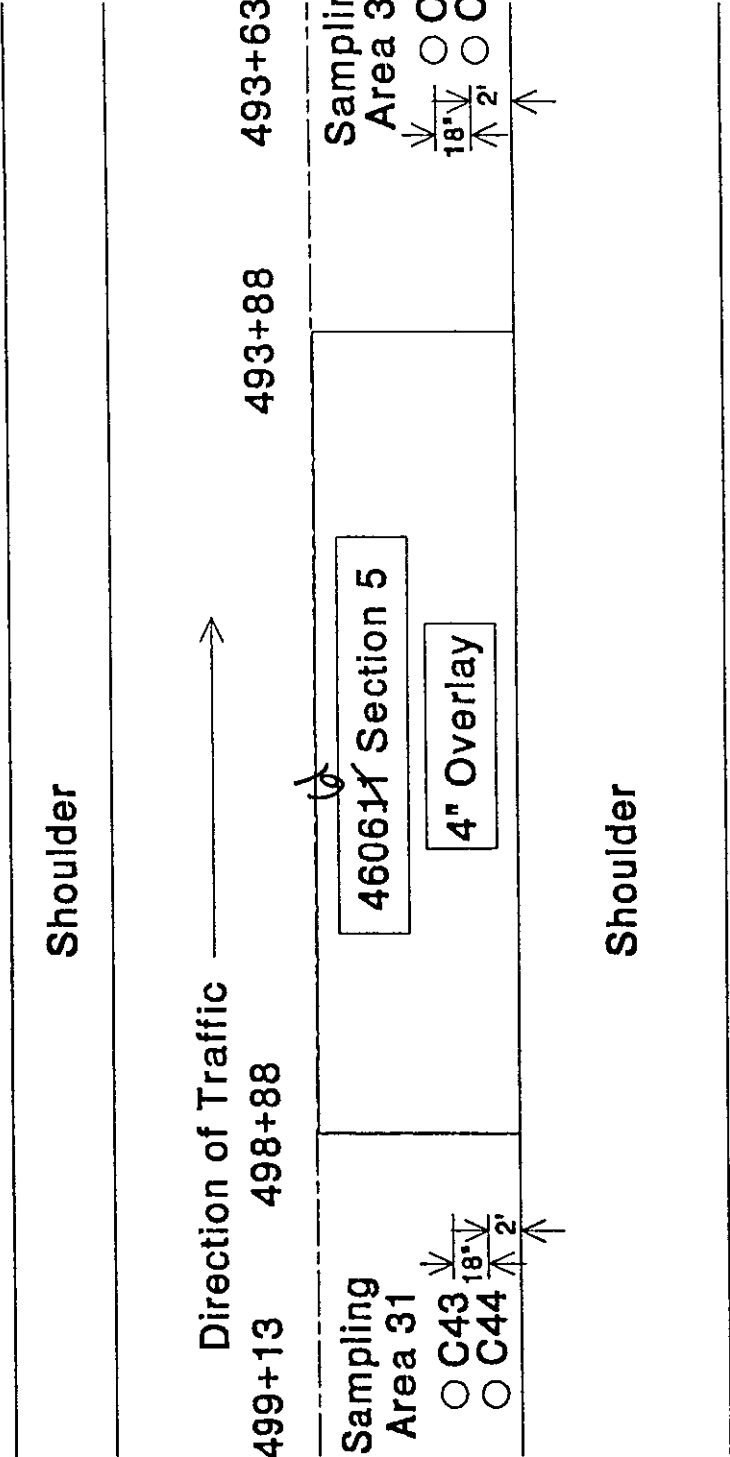
501+08 500+83

Sampling
Area 30

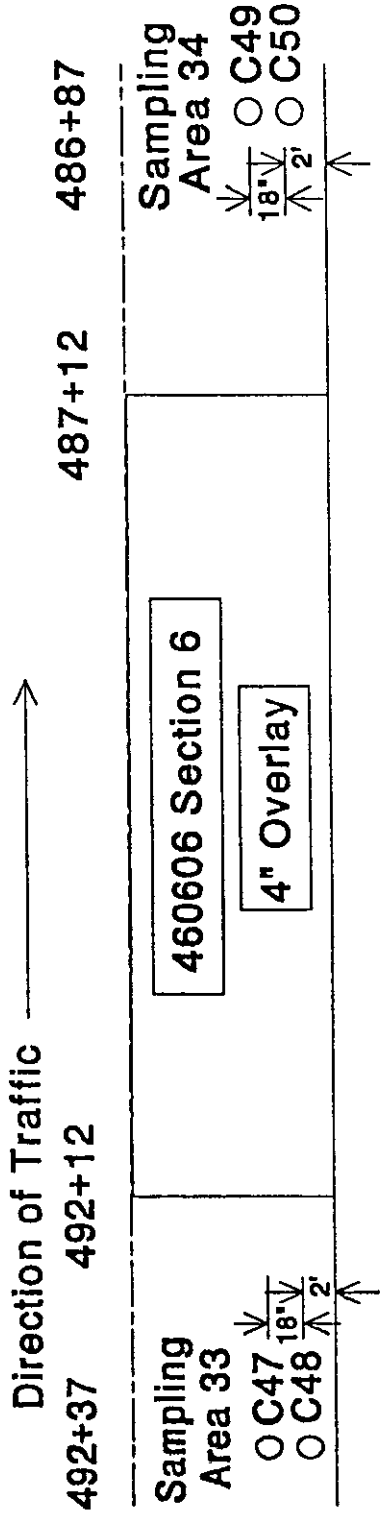
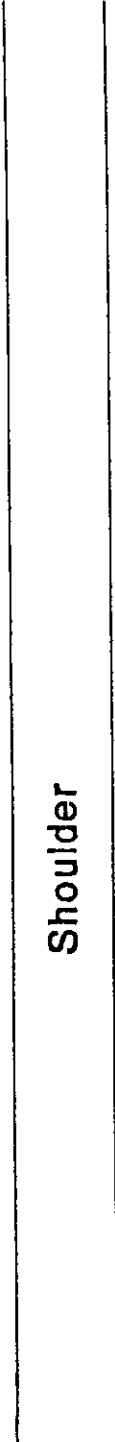
○ C41
○ C42

Shoulder

○ 4" OD Core

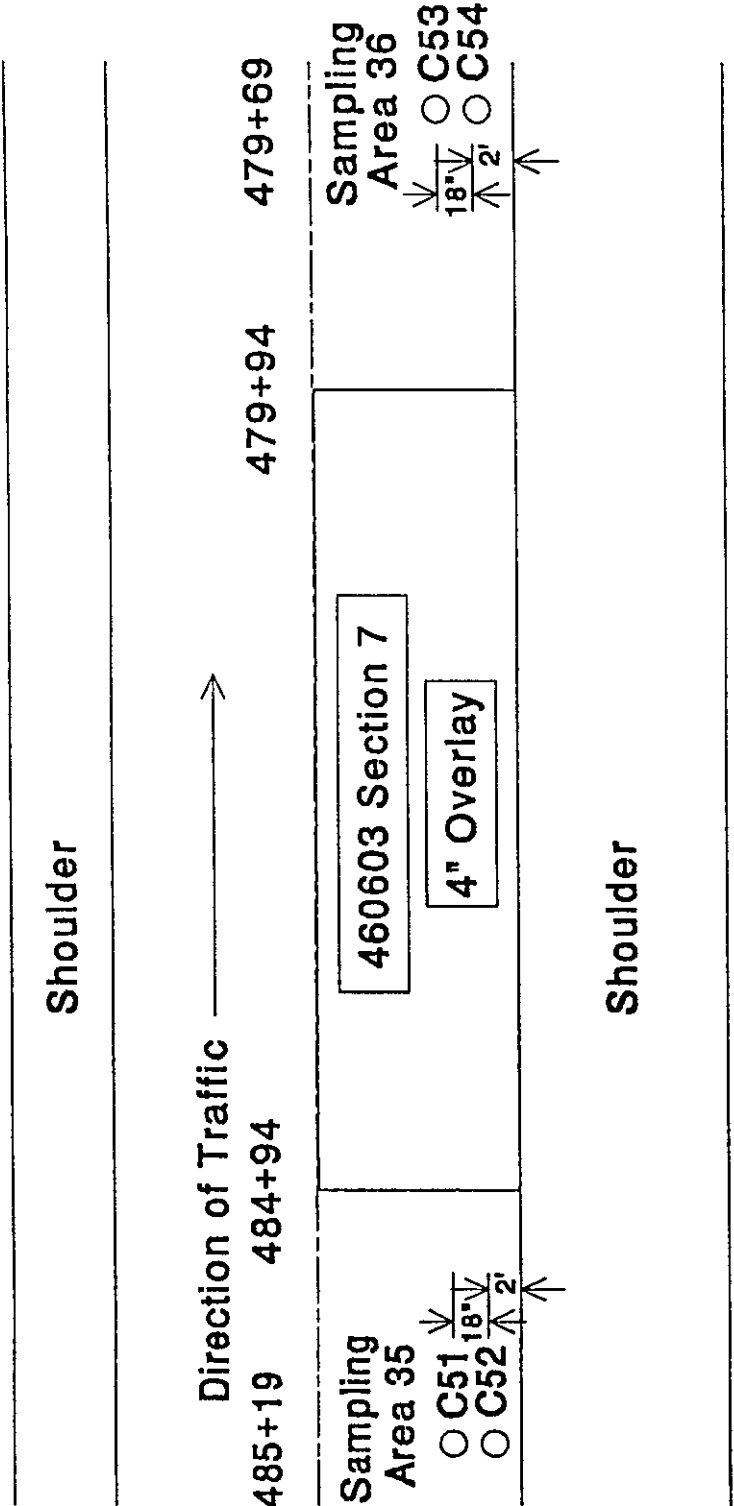


○ 4" OD Core



Shoulder

○ 4" OD Core



○ 4" OD Core

Shoulder

Direction of Traffic →

473+34 473+09

468+09 467+84

Sampling
Area 37

○ C55
○ C56

460604 Section 8

4" Overlay

Sampling
Area 38

○ C57
○ C58

Shoulder

○ 4" OD Core

Attachment G
Test Section Construction Activities

Test Section Construction Activities

Test Section	Asphalt Concrete Class G Depth	PCC Pavement Cracking & Sealing	PCC Pavement Joint Sealing	Sealing Random Cracks	Spall Repair	Full Depth Repair	Install Dowel In Sawed Slot	PCC Pavement Grinding	PCC Pavement Undersealing	Edge Drain	Saw & Seal Joints In Asphalt Concrete	Install Reinforcing Grid
460608	8	Yes	No	No	No	No	No	No	No	Yes	No	No
460660	6	Yes	No	No	No	No	No	No	No	Yes	No	No
460607	4	Yes	No	No	No	No	No	No	No	Yes	No	No
460662	4	Yes	No	No	No	No	No	No	No	Yes	No	Yes
460661	4	No	No	No	Yes	Yes	No	No	No	No	No	Yes
460606	4	No	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No
460603	4	No	No	No	Yes	Yes	No	No	No	No	No	No
460604	4	No	No	No	Yes	Yes	No	No	No	No	Yes	No
460605	-	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No
460602	-	No	Yes	Yes	No	Yes	No	Yes	No	No	No	No
460601	-	No	No	No	No	No	No	No	No	No	No	No